# SCIENCE

FRIDAY, JULY 31, 1914

CONTENTS

*Memorial on the Foundation of an International Chemical Institute:* PROFESSOR WILHELM OSTWALD ..... 147

*The Man of Piltdown:* PROFESSOR GEORGE GRANT MACCURDY ..... 158

*The Production of Coal in 1913* ..... 160

*The Rockefeller Institute for Medical Research* ..... 161

*Scientific Notes and News* ..... 162

*University and Educational News* ..... 165

*Discussion and Correspondence:*—

*Tin Disease and Polar Exploration:* B. T. BROOKS. *Cubist Science:* J. F. A. *Motions of the Atmosphere:* PROFESSOR CLEVELAND ABBE ..... 166

*Scientific Books:*—

*Stevens on the Fungi which cause Plant Disease:* DR. F. D. HEALD. *Jones's The New Era in Chemistry:* PROFESSOR EDWARD C. FRANKLIN. *Thomson on Rays of Positive Electricity and their Application to Chemical Analysis:* PROFESSOR R. A. MILLIKAN. 168

*Special Articles:*—

*Desiccation of Certain Gregarine Cysts:* PROFESSOR MAX M. ELLIS. *Semi-permeable Capsules:* WILLIAM W. BROWNE AND DAVID SOLETSKY ..... 174

*Societies and Academies:*—

*The Wisconusin Academy of Sciences, Arts and Letters:* ARTHUR BEATTY. *The Kentucky Academy of Science:* GARNETT RYLAND. *New Orleans Academy of Science:* DR. R. S. COCKS ..... 177

MSS. intended for publication and books, etc., intended for review should be sent to Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

## *MEMORIAL ON THE FOUNDATION OF AN INTERNATIONAL CHEMICAL INSTITUTE*[1]

### GENERAL

THE recent foundation with such exceptional rapidity and unanimity of the International Association of Chemic Societies shows that chemistry, as a science, has advanced to a position where unregulated individual efforts are no longer sufficient and must be replaced by organizing the efforts of all chemists.

The participants in that formative meeting held in Paris toward the end of April, 1911, had not given the subject much previous thought, nevertheless even in this preliminary discussion a large number of undertakings of general interest were mentioned which showed how keenly the need of organizing all chemic activities is felt.

Such possible and necessary undertakings of general value discussed in the proceedings are:

1. The uniformity of nomenclature of chemic substances.

2. The inclusion of the international committee of atomic weights in the Association of Chemic Societies.

3. Uniformity in the nomenclature of physic and chemic constants.

4. Conformity in the editing of tables of contents of chemic publications.

5. A standardization of the writing of abstracts and other reviews of the new publications in chemistry.

6. The preparation of an international auxiliary language for publications of universal interest.

7. Standardization of the size of publications.

8. Arrangements for limiting the printing of an article in different publications.

9. Preparation of a chemic thesaurus in which

[1] Translated by Adolf Law Voge.

the gist of all chemic knowledge will be presented in a clear and trustworthy manner.

If one compares this abundance of new problems to which a little thought would add many more, with the means at the disposal of the International Association of Chemic Societies, one perceives the great disparity between them.

Many of the undertakings suggested require for their execution an institute at some fixed place, in which the requisite accessories, primarily a permanent and exhaustive library of chemical literature, are at hand; and where the methods of executing these new and difficult tasks can receive systematic test and improvement. Besides the organization of the scientifically trained chemists of the world, which has been practically accomplished by the International Association of Chemical Societies, it seems absolutely necessary to consider the creation of an establishment to perform the tasks set by this general body.

Immediately after the adjournment of the Association in the first days of May, I undertook as a task logically resulting from the formation of the Association, to consider providing for that permanent work-place, and endeavored by means of a provisional plan of organization to discover whether and in what way this great new problem could be solved. Since I was almost immediately fortunate enough to discuss them at length with Ernest Solvay in Brussels, these plans gained greatly in clearness, and, I believe, in possibility for realization. This successful organizer at that time expressed himself as ready, if the arrangements decided upon met with his approval, to contribute toward the founding of the Institute, a quarter million francs ($50,000). Unfortunately because of the pressure of his various business interests he felt it necessary to decline the permanent directorship of such an institute, which at first there was a prospect of his assuming.

### AN INTERNATIONAL INSTITUTE OF CHEMISTRY

I considered my plan further, and attempted by means of a number of different sketches for its organization to form a clear idea of the various possibilities.

The proposal here presented is the result of those considerations; and is merely intended at present to show the feasibility of the new project! Naturally, all sorts of impracticabilities will become incorporated in such a new conception. These will be recognized and remedied as the institute expands and evolves. However, even now we can form a general idea of the operation of such an international institute. Such an institute seems to me so appropriate and desirable, that I feel the time is come to transform thoughts into action. Chemic science should be provided as soon as possible with the exceptionally versatile and far-reaching aid which would come from such an institution.

### TASKS OF THE INSTITUTE

To guard at the very beginning against possible misunderstanding it should be emphasized that the proposed International Institute of Chemistry is to be in a certain sense a complement to the institutes for scientific investigation which were founded on the occasion of the centennial of the University of Berlin. Not in the highest spheres of creative scientific work are to be the labors of the International Institute of Chemistry; on the contrary those tasks in the realm of chemical science which are ever recurring in the same form are to be carried out there once for all, and placed at the service of every one; especially the literary reference work and everything connected with it; that is, the most trivial and routine labors which are necessary for the advancement of the science. Consequently in the future it should be a fundamental

principle in our science that no task of this kind once carried out need ever be repeated, for the finished work should be kept continually and regularly at the disposal of those whom it concerns.

In other words the International Institute of Chemistry is to have a function similar to that exercised by the Reichsanstalt of Technology in the revision and correction of thermometers, voltmeters and other instruments. Formerly the correction of a thermometer or other measuring instrument was the work of many weeks, now it is done by the Reichsanstalt in a very short time, and with far greater accuracy than is possible to an isolated physicist.

In chemistry to-day, likewise, there are a large number of tasks which must be done over and over again by the individual, because what has once been performed is not always accessible to the public. Just as the Reichsanstalt of Technology can make the correction of thermometers much more certainly and reliably than the average physicist could (without a disproportionate expenditure of energy) because this mechanical work is done regularly and systematically at the central bureau so these eternally recurring chemic tasks could be incomparably better and more accurately carried out at a central bureau than by the average inexperienced chemist. And if the regret is voiced, as it has been to me, that the useful art of making effective collections of literature would be entirely lost through the founding of an international institute of chemistry, the answer is that the loss of the art would mean no actual loss at all. For once the International Institute of Chemistry is founded it will furnish a permanent and perpetual organ of the whole science, which will perform its special functions far better than isolated chemists have performed them, and which will therefore make this sort of skill in the individual absolutely superfluous.

In a certain stage of its development the human embryo has gills, inherited from its aquatic ancestors. No one laments the fact that these gills never develop. For the conditions of man's life have become such that those organs would never be used. So the existence of the International Institute of Chemistry will alter working conditions for the future chemist so that he will not need to acquire skill in the sort of work which can be done by the Institute far better, and it would be a waste of time and energy for him to try to acquire these obsolete functions. The more the individual chemist can be emancipated from such mechanical tasks which give a disproportionate amount of trouble because of their infrequency, the more time and energy he will have for the real investigation which depends on his special training.

### THE ORGANIZATION OF THE SCIENCE

A process is going on in chemistry which we have often observed in other phases of civilization. A hundred years ago the housewife was obliged not only to make bread, but to dip candles and boil soap. To-day these duties have been taken from her by special manufactories, and she has leisure to devote herself with greater zeal and success to her duties in the domain of the rearing of children. In just the same way a division of labor is taking place in all other fields. Man is constantly becoming more and more a creature working only with his brains, who leaves mechanical or partially mechanical operations to machinery. It need not be further emphasized that by such systematic cooperation, by the development of highly developed organs, infinitely more can be accomplished than under the earlier conditions of haphazard individual work. In the history of chemistry we certainly can find instances where extremely difficult compilations were carried on at first by one man,

who with the growth of the work was obliged to surrender it for completion to a group of men. It is true that during the second half of his life Berzelius prepared the Jahresbericht; but in his later years it was clearly seen how impossible it was for a single investigator to retain the power of passing appropriate and unprejudiced judgment on all contemporary works. The Jahresbericht in so far as it still exists has long been the product of the cooperation of a specially trained group of men.

In precisely the same way the Index of Organic Chemistry was created by the indefatigable Beilstein, but to-day there is no scientist of equal caliber who can carry on this enormous work in the same spirit and with the same reliability. Here it has been necessary to intrust the continuation of the work of a single man to a whole staff.

All these instances show most clearly the need of an international general organization of chemic undertakings of this kind. The work done, for example, by the commission in preparing the supplement to the Beilstein Index is of benefit not only to the German chemists but to the chemists of the whole world, and should therefore be done not by a German, but by an international institute. The same holds true of all other general undertakings in chemistry; for chemistry, like every other science, is entirely independent of national peculiarities.

### NEW FUNCTIONS AND ORGANS

It must not be forgotten, either, that the capacities which enable a man to prepare an ideal abstract or an ideal review are not those which distinguish the investigator and discoverer. The maturity of an organism is shown most clearly by its differentiation of function. This differentiation of function has no other purpose than the bringing about of greater efficiency through specially adapted organs. So too in the future International Institute of Chemistry, a special technique of collecting and abstracting will be evolved which will bring about far greater speed, completeness and reliability than appears possible with our hitherto somewhat haphazard methods.

We appreciate too, that this wearing and severe work of abstracting is almost always done by young men, who work only a few years, not with any idea of making it a profession—merely for the sake of eking out their incomes. As soon as the young man obtains a better position he renounces this work. Therefore proficiency in this work must continually be attained anew, so that no high degree of excellence is ever reached. But so soon as this kind of work is undertaken by specially fitted people as a life work, it will not only be incomparably better done, but there will be an ever higher standard of excellence in the individual production. Present-day abstracts, for example, leave a great deal to be desired, as every one knows who has been obliged to use them, because a scientific treatment of the question of what belongs in an abstract and what can be left out has actually never yet appeared. The individual abstractor is thrown on his own sense of fitness and such instructions as are vouchsafed him by the director when his errors are too flagrant. In the case of lifelong occupation with such problems, the technique of abstracting will be developed to a real science, and the workers whose scientific ambition is concentrated on this problem will be able to write abstracts which could actually supplant the original, because one could find in them with certainty the essential points of the original article. Such a technique is the more necessary because it has long been impossible

for the individual to keep pace with the progress of his science. He is dependent on abstracts, and moreover on their appearing with great promptness, if he would not lose his survey of the entire work of his field. So the work of abstracting to be organized in the International Institute of Chemistry will not only make the older literature specially accessible, but will satisfy this daily more pressing need in giving the investigator an exhaustive survey of his special problems, a survey which can reach according to requirements from the earliest times to the present. Any one who for scientific or economic reasons wishes to follow the progress of any special problem can be assured if he makes use of the Institute, that nothing of importance will escape his notice; but at present it is physically and financially impossible for an individual to have instant recourse to the existing literature of a subject.

### NEW MEANS OF PUBLICATIONS

Since the present means of publication, the periodicals, yearly reviews, the monthly or quarterly compilation, the Zentralblatt, have shown themselves increasingly insufficient to the increasingly complex and urgent demands of science and technology, the developing science must create new organs of interpretation to make itself effective and can not delay till these organs are provided for it from without. As always with such innovations the need is seen much sooner than the means of satisfying it. There is no other way except for those men who have seen the need and discovered the means of its satisfaction, to produce those means even at considerable personal sacrifice. When the organ has begun its regular activity and shown its usefulness and indispensability, it will no longer be so difficult to obtain the necessary money for its support.

### THE INTERNATIONAL INSTITUTE OF CHEMISTRY

The first thing then for us to do is to bring the International Institute of Chemistry so far into being that it can perform its real functions, and show clearly its advantages. Let that go on uninterruptedly for five to ten years, and it can safely be assumed that such an institution will show its public and general usefulness so plainly that public and general funds will be provided for its permanent maintenance.

On the other hand if it were premature or impracticable, time would show that too.

The benefits of such an institution would extend far beyond the circle of its own science, large as that circle is, thanks to the extraordinary development of chemistry in the last century.

But something similar to the systematization which is necessary in this special field is demanded by all other sciences and many other of the common interests of humanity. Because of the enormous facilitation of personal intercourse by trains and steamers and of intellectual intercourse by books, newspapers, letters, the telephone, the telegraph, the wireless telegraph, etc., mankind is concentrated into a much smaller space than formerly. The isolated groups, the nations, which were formerly separated by great distances, and possessed few interests in common, are suddenly forced into great interdependence, and the problem of organization, that is, the continual and regular connection of these groups of humanity is the most pressing problem of the time. Just as the science of chemistry will create in the International Institute its own organ for performance of tasks for the general good, so will similar organs be developed in the most various enterprises, and we chemists who originated the *Jahresbericht* as the first of its kind, will have the honor of doing pioneer service in this

field also—the organization of a whole science. It is true that many kinds of international scientific organizations will have preceded the International Institute of Chemistry. I need only mention the International Bureau of Weights and Measures in Sevres. But the work of independently organizing a whole science so that its mechanical functions will be completely taken away from the general public, may be called entirely new, and to those who perceive the necessity and practicability of such an organization and do their part toward its realization, will remain the incontestable honor of having done pioneer service in one of the most important departments of civilization of all humanity.

### LOCATION OF THE INSTITUTE

We turn now to the question of the practical organization of such an institute.

It must be emphasized in the beginning that we are considering not a traveling, but a large permanent institute with numerous buildings, collections, laboratories, etc. The first question to be decided is that of the location. At first glance it seems a matter of indifference where it be placed, provided only certain general conditions be fulfilled. The institute must not be too far removed from some center of intercourse, that the necessary communication with the general public may be carried on without loss of time. We should agree that the institute must be located in Europe, because the greatest spacial density of chemical activity is in Europe, and the intercourse between the individual chemists and the institute could be carried on with the least possible loss of time. To be sure we recognize that a second center of gravity of chemic science and technology is to be found on the other side of the Atlantic Ocean in North America, and that the formation of a sister institution in America is essential. Such a sister institution would be specially advantageous because the work in common would be divided between the two institutes, and together they could cover the literature of the past in half the time. Meanwhile, for the reasons already given, it is Europe's duty and also her right to undertake the founding of the first institute, and to do the pioneer work in the execution of this plan. As regards the more exact situation of the institute, I have considered the neighborhood of Brussels, in the hope that Ernest Solvay would place his great talents as an organizer at the service of the institute. Since this hope can no longer be realized, the question of the location of the institute for the present is relegated to the background. The decision will depend largely upon where and how the funds for the institute are obtained.

### DUTIES AND ARRANGEMENT OF THE INSTITUTE

On a suitable piece of ground of at least five hektares, in the vicinity of a great city, the buildings of The International Institute of Chemistry will be erected. Each department will be housed in a separate building, specially arranged and fitted out, but these buildings are to be so connected that the assistants can go from one to another without loss of time, and danger from exposure. So I planned to have the main building long and wide, built through the length of the grounds. From this, on either side, at suitable distances, will open the wings in which the departments of the institute are to be housed. The easy mode of communication between the wing buildings furnished by this corridor will be of primary importance in the operation of the institute.

I have considered the following departments, each of which will be housed in a separate wing.

## CHEMICAL WORLD LIBRARY

### *A Library of the Entire Literature of Chemistry*

I offer as a foundation for this library my private library of some 7,000 volumes and 12,000 pamphlets (dissertations). It contains the most important chemic and physic journals in complete or nearly complete series, as well as several thousand single volumes covering all fields of chemic science.

The expansion of this library which must have as its aim the possession of every book on any chemic subject, will take place partly through purchase, mainly through donations. Such gifts will often be made us by public-spirited chemists who many times are glad to get rid of duplicates, and books for which they have no use. Further, we anticipate that all chemists will give copies of their newly published work to the library, that publishers of periodicals, scientific societies and all other institutions, for the propagation of chemic literature, will place copies of their publications at the service of the institute free of cost. In this way the library can be maintained at a very slight cost. The presence of a new book in the library of the institute, instead of hindering its sale to private parties, will prove the best possible advertisement for publishers.

#### INDEX OF CHEMIC SUBSTANCES

This library will furnish the working material for two or three other departments.

First of all a card index of all chemicals will be prepared, according to the well-known principles of card-indexing. This will contain citations to all the literature on these substances. It will form automatically the foundation for a complete history of the study of chemical substances. This will do away with the necessity of those historic introductions with which chemic literature, particularly the dissertations, are so senselessly burdened, because every one will know that he can obtain a complete historic survey from the card catalogue of the institute. This department will furnish compilations of the entire literature on any chemic substance to any member of the institute, or any inquirer, for the cost of copying or gratis. How greatly this will facilitate scientific work will be appreciated by any one who has tried to collect the whole literature on some chemic subject. There is always the chance that something will be found of vital importance, which has been hitherto overlooked because there has been no systematic organization of all chemic literature.

#### INDEX OF TERMS

As a supplement to the card catalogue of chemic substances, there will be prepared a similar catalogue of all chemic terms. The terms, as well as the substances will first undergo a process of crystallization and purification. The history of the development of chemic terms is no less important than the history of the substances themselves.

#### INDEX OF PERSONS

The third and final collection will be an index of all chemists, dead as well as living. An exhaustive compilation will be made of the entire literature of each investigator who has taken or is taking part in the development of chemic science.

This will form automatically a directory of all chemists of the world who have published. Eventually it will be enlarged to embrace not only the chemists who have come in contact with printer's ink, but all who have in any way been connected with chemistry, pure or applied. The lists of members of all chemic societies, as they appear each year, will serve as foundation for this directory. So in the future it will be

possible for any chemist to communicate with any other chemist in the whole world.

### THE ABSTRACTING DEPARTMENT

Chemists long ago realized how extremely uneconomically the abstracting of contemporary scientific literature is done. Not only is all chemic literature abstracted in German in the *Zentralblatt,* in English abstracted twice, once by the English and once by the American society, in French by the French societies, and in other languages, such as Italian and Russian, by their societies; there are in addition a large number of periodicals for special branches of chemistry which prepare quarterly, semi-annual or annual bibliographies in their own fields. It can be said without exaggeration, that every article is abstracted on the average from five to ten times, and this so necessary work is done with from five to ten times too great an expenditure of energy. And withal the individual abstracts, for the reasons already given, are always more or less incomplete. If carried on by a central bureau, with assistants all over the world, if necessary, this work would be done for a small fraction of the present expense and far more quickly and accurately.

I realize that it will be some time before the centralization takes place, for the present institutions will not vanish at a word. But even those who cherish a prejudice against such centralization can not deny that with the rapid increase of chemic literature the old organizations will sooner or later prove inadequate, and a central organization become a necessity. It is always better to recognize such necessities as early as possible, because the changes can more easily be introduced when the material is not yet too overwhelming than when up to our necks in the water of chemic literature.

### CHEMIC REFERENCE AND TEXT-BOOKS

From the reference department will come eventually the material for the great encyclopedia of all chemistry. In this book everything done and being done in the fields of chemic science and technology will be systematically compiled. Such a work would necessarily be of so enormous a scope that its complete publication could not be considered for the present. But it will exist in the form of the systematically arranged references in the International Institute of Chemistry.

There will, of course, be a second copy in America. It will be possible for any one who has a special interest in any question to have compiled for him the entire reference material on this subject. The Institute will make special arrangements for the copying of single portions of the complete work, at nominal prices which need scarcely cover the actual cost, so that any chemist can have access to the part of this huge work covering his own field.

It need scarcely be mentioned that smaller reference and text-books can be compiled from the same material. The preparation of the literary structure of all chemic texts would be placed on a much higher scientific and technical basis than at present. Now each individual author must write work all over again which has been written many times before, or lay himself open to the charge of plagiarism.

### INTERNATIONAL AUXILIARY LANGUAGE

There would also be various departments for the more complete utilization of the work done by the main institution. I would mention specially the bureau of translation which, if necessary, could be later developed into the bureau of an international auxiliary language. The great variety of chemic literature which appears in different languages is very imperfectly utilized

for the advancement of the science. Whatever is published in Russian or Roumanian or some other little-known language is read only by a comparatively small circle and a translation into some more familiar language is necessary to add such articles, sometimes of very great value, to our stores of knowledge. In a paper which appeared in January in the *Zeitschrift fuer physikalische Chemie*[2] I worked out an international chemic nomenclature, founded on the world language Ido. I showed that a chemic nomenclature in a plastic, artificial language is better, more consistent and more comprehensible than in any natural language. With the comparatively limited range of terms and conceptions used in a special science like chemistry, the formation of an artificial language is a comparatively easy task. The attempts at the construction of some such universal means of communication, which have been made with increasing zeal during the last forty years have undoubtedly shown its practicability. Such an artificial language is far better suited to our purposes than any natural language. These facts are not so well known as they deserve to be. They are none the less true and will be confirmed by well-known members of our science.

So it is possible for us to make the intellectual treasures of our science equally accessible to all the chemists of the world through a common language. We need only choose one of the artificial systems already at hand. Because Ido is the only one in which a systematic chemic nomenclature has been worked out, we should turn our attention first to that scientifically perfected idiom.

### THE COLLECTION OF CHEMICALS

The departments already described cover the literary side of science. Provision must also be made for the experimental practical side in such an international institute. Here the first essential is a complete collection of all existing chemicals of absolute purity and reliability. Such a collection would be made not only for systematic and didactic reasons. The chemist who happened in his experimenting to prepare a substance possibly never prepared by him before, could secure samples from the institute for comparison. Further, such samples would be of service when a determination of any physical properties of the substances was to be made. Every one who has done such work knows that the most arduous part is the preparation of the materials for the experiment while the actual determination of the properties is comparatively easy and rapid. Instead of preparing the same substance in one laboratory for the determination of the refraction coefficients, in another laboratory for the magnetic rotation of the plane of polarized light, and in a third for its absorption of ultra-violet or ultra-red light and so on, the collections of the International Institute could be used everywhere for the determination of all possible properties. The objection has been raised to this plan that there are numerous substances which can not be kept indefinitely without deterioration, and could not therefore be used satisfactorily for such purposes. The answer to this objection is that naturally a laboratory would be connected with this department where new substances could be prepared and where fresh materials could be produced and the purity of substances which were to serve in standardizing operations could be tested.

It must again be emphasized that the aim is far less to undertake pioneer investigations than to rationally support enterprises already mentioned, with the means at the disposal of the institute. This is to be done according to the fundamental prin-

[2] Vol. 76, p. 1–20.

ciple that any sort of work which has once been satisfactorily performed is to be regarded as definitely finished for the whole science, and that such work be ever at the disposal of the entire science.

### ROOMS FOR TRANSITORY WORKERS

Finally a special division of the institute must be mentioned, the necessity for which must often have occurred to any one who has attentively followed these considerations. It is the building in which simple rooms for the accommodation of transitory workers in the institute will be provided. The incomparable services which the institute would soon be in a position to render would not only offer opportunities to the regular assistants for pursuing their investigations, but would attract voluntary workers who wished to make use of the aids offered by the institute for their particular problems. The most liberal opportunities should be afforded them, for the institute is to stand at the service of the public.

Such people should be able to reside for a longer or a shorter time in the institute. The provision for them can be the simplest possible. A sufficiently large sleeping room with the necessary toilet arrangements is quite enough, for the work will be carried on in the different departments of the institute and the rooms need not be equipped for that purpose. Provision for serving meals should also be made so that the assistants can remain at the institute through the entire working day and obtain warm food when desired. This is an arrangement more advantageous to brain workers like those of the institute than it is to manual workers.

### ORGANIZATION OF CHEMIC SCIENCE

Only the most important divisions have been mentioned, the development of which must be considered by the International Institute.

When these first, more important departments have become active, the other sides of the problem for the thorough organization of the institute must be taken up. Opportunity is afforded here for individual donors to endow parts of the work to which they are specially devoted.

This holds especially for the numerous and versatile fields of applied chemistry, which have not been mentioned in this paper. From this it is by no means to be inferred that they would be excluded from the institute. They have been omitted from the paper because the purely scientific field, being fundamental, must precede; and because the author is much less conversant with them than with pure science.

In the directing bodies of the International Institute (to be explained later) are to be representatives of applied chemistry and from their suggestions proper attention will be paid to these subjects.

In chemistry the pure and applied sciences are so happily affiliated that exemplary arrangements can be attained to more easily than in most other fields of applied science.

### DIRECTION OF THE INSTITUTE

Again emphasizing the fact that the following is merely a suggestive plan evolved after long meditation and discussion, and is not at all to be regarded as a fixed unchangeable arrangement, I conceive of the International Chemical Institute being directed in the following way:

The higher direction of the institute will be entrusted to a triple presidency, one member of which will direct the scientific, another the economic and financial activities while the third will be the president of the International Association of Chemic Societies. The separation of the scientific

from the economic activity is a necessity. A distinguished president in one of these activities would scarcely prove an excellent one in the other; yet it is evident that both phases of the work must be executed with equal excellence. The need of the third member of the presiding body scarcely demands an explanation.

It is naturally necessary that there should be a close and carefully defined connection between the International Chemical Institute and the International Association of Chemical Societies. The International Chemical Institute is, so to speak, the executive for the widest needs of chemistry in general, as represented by the International Association of Chemic Societies. Through this constant connection of the Institute with the Association, joined to the annual change in the representative of the Association, a vivifying factor will be introduced in the Institute, so easily neglected when the management remains always the same.

To the president of scientific activities the directors of the different scientific departments will be subordinate. These directors will have independent control of their own sections. These latter should all be lifelong positions for which the most capable and experienced occupants must be found. Each departmental director will be served by a larger or smaller group of assistants according to the type of work of the department. Each of these departments must be operated efficiently and according to the most recent progress in technique—which goes without saying in an institute founded on truly scientific principles.

Further two more bodies could well be formed, standing in a freer relation to the institute. First, a scientific council which together with the president of the International Association of Chemic Societies will provide the Institute with requisite new suggestions, demands and methods. This will be an independent body formed of leaders in scientific and technical chemistry throughout the world. It will meet, say, annually for free discussion concerning the management and development of the Institute. Perhaps its function can be partly performed by the Council of the International Association of Chemic Societies.

A second similarly constituted body will be formed of those who have aided in founding and supporting the institute, through gifts of importance whether of money, materials, books, chemicals, etc. This body would support the president of finances as the other would the president of science and would act particularly when funds were to be secured, or the activity of the Institute expanded and new departments formed.

### MEMBERSHIP OF THE INSTITUTE

Concerning the relation of the Institute to chemists the world over, I conceive of the following connection:

The extraordinary simplification and help which every one can obtain from the Institute for work in our field justifies a certain pecuniary support from those so aided. On the other hand it must be borne in mind that the majority of our colleagues are not in brilliant pecuniary positions so that this fee must be made relatively small. Yearly dues of one to two dollars could be borne by all whose work would be furthered by use of the institute and would be large enough to aid materially.

The membership of the chemic societies of the world is about 20,000; assuming that half of these became members of the Institute an annual fee of one dollar would yield a yearly income of ten thousand dollars; a two dollar fee yield twice as

much. That is a sum almost sufficient for the salaries of the staff, at first.

Unattainable in the first or second year, this membership should be reached in the fifth year of the Institute's existence; and after the first decennium the benefits of the Institute will have been so incontestably proven, that no chemist, whatever his activity, will find it practicable to carry out his work without using it. Then the annual membership fees would amount to much more than we have assumed.

### CONDITIONS FOR THE FOUNDATION

The foundation of so great an institution is not possible on the uncertain basis of membership fees. A realization of the entire plan can only be expected when a definite sum of money has been assured for the first outlay, and a yearly income guaranteed for a number of years.

After repeated calculation of the requirements and conditions and with the feasible assumption that nothing need be allowed for the purchase of the land, I assume that with an endowment of $150,000 and an annuity of $12,000 for five or ten years, the Institute could be called into being without subjecting ourselves to the stigma of financial rashness.

Neither sum can be obtained except through the willing participation of those persons and institutions who would derive personal or public benefit from the International Chemical Institute or who wished to serve as public benefactors.

Personal solicitations will be instituted to obtain this endowment for the establishment of the International Chemical Institute.

The liberality of one or another country will eventually decide where in Europe the main institute is to be located.

Wilhelm Ostwald

## THE MAN OF PILTDOWN

The story of the Piltdown discovery is already more or less familiar to readers of this journal.[1] But the recent gathering and publishing of additional data[2] on the subject should not be allowed to pass unnoticed. This is especially true not only because of the far-reaching significance of the discovery, but also because British scientists have been known to be at odds concerning the reconstruction of the skull in question.

It will be recalled that Dr. Smith Woodward regarded the Piltdown specimen as the type of a new genus of the family Hominidæ, to which he gave the name *Eoanthropus dawsoni*, and which was defined primarily by the characters of the mandible. Of the mandible only the right ramus with first and second molar teeth *in situ* was at first discovered. The condyle and symphysis were both lacking, but the fragment was of sufficient size to enable Dr. Smith Woodward to reconstruct the symphysis with a fair degree of accuracy. It was the reconstruction of the cranium about which differences of opinion arose between Dr. Smith Woodward and Professor Elliot Smith, on the one hand, and Professor Arthur Keith, on the other.

Of the brain case nine fragments, parts of the frontal, parietal, occipital and temporal, were found. From these Dr. Smith Woodward reconstructed a skull with a capacity of about 1,076 c.c. On the other hand, a reconstruction by Professor Keith gave to the skull a brain capacity of 1,500 c.c., in other words, that of a well-developed modern European skull. After further study Dr. Smith Woodward acknowledges a small error. He finds that the "longitudinal ridge along the outer face at the hinder end of the parietal region is not median, but one of a pair such as frequently occurs in the lower types of human crania." In the published reconstruction there should thus be a slight readjustment of the occipital

[1] Science, January 17, 1913.

[2] Chas. Dawson and A. Smith Woodward, "Supplementary Note on the Discovery of a Palæolithic Human Skull and Mandible at Piltdown (Sussex)," *Quar. Jour. Geol. Soc.*, LXX., April, 1914.

and right parietal bones, "but the result does not alter essentially any of the conclusions already reached."

With this opinion Professor Elliot Smith is in complete accord. From an examination of the original fragments, he was able to determine the location of the median line of the skull. The persistence of slight traces of the sagittal suture in the regions of the bregma and lambda made this possible. The true median plane in this particular case, however, passes a little to the left of the union of the coronal with the sagittal suture owing to a slight deflection of the latter. Since this deflection is never more than a few millimeters (except where large bregmatic wormian bones are present and they are not present in this case), the bregma and lambda are good guides in locating the median plane. In line with the median plane as thus determined, the endocranial aspect of the frontal bone presents a well-defined longitudinal ridge, corresponding to the "place where the two halves of the frontal bone originally came together at the metopic suture." The cranial capacity then of the Piltdown skull is evidently not very much greater than the original estimate of 1,076 c.c.

In addition to exhaustive laboratory studies on the parts above mentioned, a painstaking and systematic search was made at the Piltdown site. The mandibular ramus had been found *in situ*. All the gravel *in situ* within a radius of five meters of this spot was "either washed with a sieve or strewn on specially prepared ground for the rain to wash it; after which the layer thus spread was mapped out in squares, and minutely examined section by section." In this spread Father Teilhard de Chardin, assisting at the work for three days, found the right canine tooth in August, 1913. The two human nasal bones and the turbinated bone were not recovered from this spread, but from disturbed gravel within less than a meter of the spot where the mandible had been discovered.

The nasal bones are said to "resemble those of existing Melanesian and African races, rather than those of the Eurasian type." In thickness they correspond to the bones of the skull previously found. The canine tooth not only corresponds in size to the mandible, but belongs to the same half (right) as that recovered. It likewise agrees with the two molar teeth in the degree of wear due to mastication. The extreme apex is missing, but whether by wear or by accidental fracture is not determinable. The enamel on the inner face of the crown has been completely removed by wear against a single opposing tooth. The worn surface "extends to the basal edge of the crown, as indicated by the clear ending of the cement along its lower margin."

This canine tooth is larger than any human canine hitherto found, and interlocked with the opposing upper canine. It rose above the level of the other teeth and was separated from the lower premolar by a diastema. On the other hand, there is no facet due to wear against the outer upper incisor, such as often occurs in the apes.

If a comparative anatomist were fitting out *Eoanthropus* with a set of canines he could not ask for anything more suitable than the tooth in question. It conforms to a law in mammalian paleontology, "that the permanent teeth of an ancestral race agree more closely in pattern with the milk-teeth than with the permanent teeth of its modified descendants." The canine of *Eoanthropus*, as might have been expected, resembles the milk canines of *Homo sapiens*, on the one hand, and *Simia salyrus*, on the other, than it does the permanent canines of either. It is pointed out that even in recent man if the base of the crown of the canine were raised in the gum to the same level as that of the adjacent teeth, its apex would frequently rise well above the rest of the dental series.

The various elements that make up the gravel bed at Piltdown are better known to-day than when the first report was published; additional fossil animal remains have also been recovered. Four well-defined layers have been determined. At the top is a deposit of surface soil 35 cm. thick, containing pottery and flint implements of various ages. The second bed consists of undisturbed gravel varying from a few centimeters to a meter in thickness.

The prevailing color is "pale yellow with occasional darker patches." A rude paleolith of the Chellean type was found in the middle of this layer, which likewise contained rolled iron-stained subangular flints. The third layer, some 50 cm. thick, is easily distinguished because of its dark ferruginous appearance. It contains rolled and subangular flints similar to those found in the layer above. All the fossils (with the exception of the remains of the deer) were either discovered in or have been traced to this third layer. So-called eoliths and at least one worked flint were likewise found here. The *Eoanthropus* remains came from it and near the uneven floor forming the upper limit of the fourth stratum. The latter has a thickness of about 25 cm., is non-fossiliferous, and "contains flints of a much larger size than any of those in the overlying strata." Nothing that could be called an implement or eolith has been reported from the fourth bed. Below are undisturbed strata of the Tunbridge Wells Sand (Cretaceous).

Our knowledge of the Piltdown fossil fauna has been supplemented by the finding of remains of one new form, a fragment of a tooth of *Rhinoceros,* in the same state of mineralization as the teeth of *Stegodon* and *Mastodon* previously described; while the specimen can not be determined with absolute certainty, it belongs either to *Rhinoceros mercki* or *R. etruscus,* with the evidence rather favoring the latter. Additional remains of *Stegodon* (fragment of a molar) and *Castor* (fragment of mandible) were likewise recovered. Judged from its fossil content, the third stratum at Piltdown would be classed as Pliocene were it not for the presence of *Eoanthropus* and the beaver. In view of the fact that the remains of these, although softer, are not so rolled and worn as the other fossil remains, the third bed, although composed in the main of Pliocene drift, was probably reconstructed in early Pleistocene times.

Those who might once have objected to the use of the name *Eoanthropus* for the Piltdown skull can no longer deny its appropriateness when applied to the lower jaw, especially since the finding of the canine tooth. While the probabilities are all in favor of the three parts belonging to one and the same individual, the case for *Eoanthropus* does not have to depend on producing positive proof to that effect. The only flint implement of Chellean type came from the layer above (No. 2), and is of later date than the human remains. Did *Eoanthropus* make use of the eoliths found in tell-tale association with him? The future holds this secret, and if hard enough pressed, may some day reveal it.

George Grant MacCurdy
Yale University,
New Haven, Conn.

---

### *THE PRODUCTION OF COAL IN 1913*

The production of coal in the United States has again broken all previous records, the output for 1913 being 570,048,125 short tons, which is considerably more than double the production of 1900 and more than eight times the production of 1880, according to a statement just issued by the United States Geological Survey, from figures compiled by Edward W. Parker, coal statistician. The value of the coal mined in 1913 is given as $760,488,785.

Compared with the previous year the output for 1913 shows an increase of 35,581,545 tons, or nearly 7 per cent. The increased activity indicated by these figures was well distributed throughout the 29 coal-producing states, 23 of which showed increases and only 6 decreased production, the decrease in one of these—Colorado—being due solely to labor trouble. Of those showing increase, 12 made record yields, and Pennsylvania, the leading coal state, broke records in both bituminous and anthracite production. The states which broke all former records in coal production were Alabama, Illinois, Kentucky, Montana, New Mexico, Ohio, Oklahoma, Pennsylvania, Texas, Utah, Virginia and West Virginia. The largest increase in the production of bituminous coal was in Pennsylvania, where 11,915,729 tons was added to the output of 1912. West Virginia showed the second largest gain, 4,522,295 tons, and Kentucky the

third largest gain, 3,126,079 tons, which was also the largest percentage of increase, amounting to 19 per cent., of all the important coal-producing states. Indiana was fourth, Illinois fifth, Ohio sixth, and Alabama seventh. While the total increase was very large as figured in tons, the percentage is what may be considered normal and indicative of healthy industrial activity throughout the country.

Coal mining, like all other industries in the Ohio Valley states, was seriously interfered with by the great floods during the spring of 1913, and Mr. Parker estimates that from 5 to 10 million tons of coal would have been added to the year's output but for this disaster. With no violent fluctuations in the demand by the blast furnaces, steel works, and other manufacturing industries, the demand for coal for those purposes shows only a normal increase. The continued decrease in the use of fuel oil in the Mid-Continent oil field and the strike in the Colorado coal mines resulted in an increased output of coal in the central and southwestern states. With a few exceptions, notably in Illinois, Indiana and Oklahoma, values ranged higher than in former normal years, so that from the producers' standpoint the conditions in 1913 were fairly satisfactory.

The development of our coal-mining industry with reference to population presents some interesting comparisons. In 1850 the coal output was 7,018,181 tons, or 0.3 ton for each of the 23,191,876 inhabitants; in 1880 the population had increased to about 50,000,000 and the production of coal to about 71,000,000 tons; an average of 1.42 tons per capita. At the close of the nineteenth century the population was 76,303,387, an increase of a little over 50 per cent. as compared with 1880, while the production of coal had increased nearly 400 per cent. in the same period and averaged 3.53 tons for each person. In 1913 the per capita production was figured at 5.85 tons. In addition to this increase in the consumption of coal, the use in recent years of petroleum and natural gas should also be considered.

The coal mines of the country gave employment in 1913 to an army of nearly three quarters of a million men—747,644. The average number of days worked by the bituminous miners in 1913 was 232, against 223 in 1912, while the average time made in the anthracite mines in 1913 was the best on record—257 days for each man. The average production per miner in the bituminous mines increased from 820 tons in 1912 to 838 tons in 1913, both being record-breaking averages, while anthracite miners increased their average from 485 tons in 1912 to 532 tons in 1913.

---

## *THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH*

THE board of scientific directors of the Rockefeller Institute for Medical Research announces the following appointments and promotions:

Dr. Hideyo Noguchi, hitherto an associate member in the department of pathology and bacteriology, has been made a member of the institute.

Dr. Alfred E. Cohn, hitherto an associate in medicine, has been made an associate member for the term of three years.

Dr. Wade H. Brown, hitherto an associate in the department of pathology and bacteriology, has been made an associate member for the term of three years.

The following assistants have been made associates:

Harold Lindsay Amoss, M.D. (pathology and bacteriology).

Arthur William Mickle Ellis, M.D (medicine).

Thomas Stotesbury Githens, M.D. (physiology and pharmacology).

Israel Simon Kleiner, M.D. (physiology and pharmacology).

Alphonse Raymond Dochez, M.D. (medicine). Dr. Dochez has also been appointed resident physician in the hospital to succeed Dr. Swift.

The following fellows have been made assistants:

Frederick Lamont Gates, M.D. (physiology and pharmacology).

Louise Pearce, M.D. (pathology and bacteriology).

The following new appointments are announced:

Chester Harmon Allen, M.S., fellow in chemistry.

Alan M. Chesney, M.D., assistant resident physician and assistant in medicine.

Harold Kniest Faber, M.D., fellow in pathology.

Ross Alexander Jamieson, M.D., assistant resident physician and assistant in medicine.

Benjamin Schönbrun Kline, M.D., fellow in physiology and pharmacology.

John Jamieson Morton, Jr., M.D., fellow in pathology.

James Kuhn Senior, M.A., fellow in chemistry.

Joseph Richard Turner, M.D., fellow in pathology.

Dr. Paul Franklin Clark, formerly associate in pathology and bacteriology has been appointed assistant professor of bacteriology in the University of Wisconsin. Dr. Homer F. Swift, formerly resident physician in the hospital and associate in medicine, has been appointed associate professor of Medicine at the College of Physicians and Surgeons, Columbia University, and associate attending physician, Presbyterian Hospital.

---

## *SCIENTIFIC NOTES AND NEWS*

The Society of Chemical Industry has awarded its medal to Sir Henry Roscoe, its first president, for his services to science.

Mr. Douglas Freshfield has been elected president of the Royal Geographical Society in succession to Lord Curzon.

The technical school at Dantzig has conferred the honorary degree of doctor of engineering on Dr. Walther Nernst, professor of physical chemistry at the University of Berlin.

In addition to the honorary degrees already noted in Science as conferred at the tercentenary celebration of Groningen University, there were conferred degrees in the sciences on two other Americans; on Professor Edward B. Van Vleck, professor of mathematics at the University of Wisconsin, and on Mr. Edward Phelps Allis, the zoologist, who resides at Mentone, France.

Dr. Henry Winston Harper, professor of chemistry in the University of Texas, received the degree of doctor of laws, from Baylor University, at its recent commencement.

On the recommendation of the committee on awards of the scientific exhibit, of which Professor Richard M. Pearce of the University of Pennsylvania was chairman, at the recent Atlantic City meeting of the American Medical Association, the first prize, the gold medal for the best scientific exhibit, was awarded to Miss Maude Slye of the Otho S. A. Sprague Memorial Institute of Chicago, for her exhibit of charts, diagrams, specimens and tables on the transmission of hereditary cancer and other diseases in mice.

Dr. Camillo Golgi, professor of pathology at Pavia, known especially for his investigations on the minute structure of the brain, celebrated his seventieth birthday on July 7.

Dr. Myles Standish, Williams professor of ophthalmology in the Harvard Medical School, has been appointed professor emeritus.

A complete list of American scientific men who have accepted invitations to attend the Australasian meeting of the British Association as the guests of the New Zealand government, is as follows:

Dr. L. H. Bailey, Ithaca, N. Y.; Mr. Lyman J. Briggs, Department of Agriculture, Washington, D. C.; Professor A. P. Coleman, Toronto University, Toronto; Dr. Edwin G. Conklin, Princeton University, Princeton, N. J.; Dr. Charles B. Davenport, Cold Spring Harbor, Long Island, N. Y.; Professor William M. Davis, Harvard University, Cambridge, Mass.; Dr. George A. Dorsey, Curator of Anthropology, Field Museum, Chicago; President G. C. Creelman, Ontario Agricultural College, Guelph, Ontario; Professor R. T. Ely, Madison, Wisconsin; Professor E. C. Franklin, Leland Stanford University, Palo Alto, Cal.; Professor P. H. Hanus, Harvard University, Cambridge, Mass.; President E. F. Nichols, Dartmouth College, Hanover, N. H.; Dr. Ira Remsen, President, Johns Hopkins University, Baltimore; Professor William M. Wheeler, Bussey Institution, Forest Hills, Boston.

Professor F. P. Leavenworth, of the University of Minnesota, is spending the summer at the Yerkes Observatory in working with the micrometer and the forty-inch telescope.

Professor C. H. Eigenmann has been appointed research professor of zoology in Indi-

ana University for the year 1915 and is accordingly relieved from all teaching. He plans to devote all but three or four months in completing his studies of the distribution of the fishes of western Ecuador and western Colombia and its bearing of this on the east and west slope fauna of Panama. He intends to spend the winter months in correlating the freshwater fauna of the lesser Antilles to that of South America.

WE learn from the *Geographical Journal* that the *Amnauer Hansen,* a small boat of about 50 tons, only some 75 feet long, started from Plymouth at the beginning of June for a two months' scientific cruise in the Atlantic. The scientific work will be under the direction of Professor Helland-Hansen, director of the Marine Biological Station at Bergen, and Professor Fridtjof Nansen and his son accompany the party. The expenses of the cruise have been partly defrayed by the Nansen fund, and the program includes observations of ocean temperatures, currents, salinities, light penetration and so forth. The vessel is constructed on the same principle as a Norwegian lifeboat, and is worked partly by motor and partly by sail.

DR. W. S. BRUCE, of Edinburgh, has left the Tyne on an expedition in the waters of Spitzbergen. It is his intention to proceed to Tromsö, where the expedition will be finally fitted out. A number of motor-boats will be used by the party. The expedition, which will last several months, will be occupied with a series of extensive soundings in the neighborhood of Spitzbergen and with the effort to chart a number of islands not at present on the maps of mariners.

PROFESSOR ELLSWORTH HUNTINGTON, of Yale University, lectured before the students in geography and geology in the Columbia University Summer Session on July 20, on "Climatic Changes and their Geographic Effects."

THE scientific society Antonio Alzate, Mexico City, celebrated on July 6 the tercentenary of the discovery of logarithms by John Napier, when a commemorative address was made by Señor Don Joaquin de Mendizabel y Tamborrel.

MRS. POYNTING has presented the scientific library of the late Professor J. H. Poynting to the physics department of the University of Birmingham.

DANIEL A. CARRION, a medical student in Lima, Peru, inoculated himself in 1885 with blood from a verruga tumor in an effort to throw light on the nature of the disease, and he died from it in less than two months. The sixth Pan-American Congress held at Lima last year started a fund for a monument to this young martyr to science, and subscriptions are now being received. The fund is in charge of the dean of the medical faculty, Professor E. Odriozola, Lima, Peru.

DR. NICHOLAS LEQUARRÉ, formerly professor of the history of geography at Lüttich, has died at the age of eighty-one years.

DR. NICOLAS JEAN-BAPTISTE DUGNET, vice-president of the Paris Academy of Medicine, died on July 4, at the age of seventy-seven years.

MISS L. E. LAWRENCE and Miss M. W. Lawrence have presented £4,000 to the Royal Society to devote the interest to the furtherance of research into the cause and cure of disease in man and animals. The donors desire to associate the gift with the memory of their father, Sir W. Lawrence, F.R.S., and their brother, Sir Trevor Lawrence.

THE Ernst Haeckel foundation for monism has transferred to the University of Jena $75,000, for the *Phyletische Archiv,* a publication of the Phyletische Museum established by Professor Haeckel.

THE Smithsonian Institution gave in the auditorium of the U. S. National Museum on July 16 an exhibition of motion pictures taken below the sea at the Bahama Islands, by the Submarine Film Corporation.

AT the second Congress for Radioactivity and Electronics held in Brussels in the year 1910, the following committee was appointed to make arrangements for the third congress: M. Curie, Paris, E. Rutherford, Manchester, I. E. Verschaffelt, Uccle (Belgium), E. v. Aubel, Gent, A. Righi, Bologna, W. Wien, Würzburg, F. Exner, Vienna, B. B. Boltwood,

New Haven, P. de Heen, Sclessin (Belgium), and the following medical gentlemen: J. Daniel, Brussels, W. Deane Butcher, London, L. Bergonie, Bordeaux, C. Lester, Philadelphia, E. Ludwig, Vienna, W. His, Berlin, A. Bayet, Brussels, L. Hauchamps, Brussels. It has been decided to hold the third congress in Vienna from June 27 until July 2, 1915, to be composed of two sections: I. Physical and Chemical Section; II. Biological and Medical Section. The following officers have been elected: *President,* Professor Sir Ernest Rutherford, Manchester; *General Secretary,* Professor Stefan Meyer, Vienna; *Sectional Secretaries,* I. The general secretary and D. V. Hess, Vienna; II. E. v. Knaffl-Lenz, Vienna. The Scientific Committee are: Section I., M. Curie, Paris; F. Exner, Vienna; E. Rutherford, Manchester; W. Wien, Würzburg. Section II., P. Degrais, Paris; W. His, Berlin; H. H. Meyer, Vienna; G. Riebl, Vienna; E. Williams, Boston.

We learn from *Nature* that the commonwealth of Australia, in connection with the approaching visit of the British Association, has issued a "Federal Handbook," describing the continent in its scientific and historical aspects. This book contains in a compressed, but readable, form more information than is elsewhere accessible. Among the more important articles may be noted that on history by Professor Ernest Scott; on physical and general geography by Mr. Griffith Taylor, and a very useful account of the culture and beliefs of the aborigines by Professor Baldwin Spencer. The book is at present issued only in a limited edition, but it may be re-issued to meet the wants of a wider public.

At the forty-fourth Fruit Growers' convention held at Davis, California, June 1–6, the plant pathologists of California and neighboring states met and formed a local society to be known as the Western American Phytopathological Society. The purpose of the society is to hold meetings annually or semi-annually for the discussion of plant disease problems, to bring together workers for mutual assistance and stimulation. The territory which the society proposes to cover is in a general way that from the Rocky Mountains westward to the Pacific coast of the United States, Canada and Mexico. The society is to consist of members of the American Phytopathological Society located in the general region and associate members chosen by the membership committee. In addition to the practical plant disease discussions presented to the fruit growers at Davis, several more technical papers were presented. R. E. Smith, Berkeley, California, was elected president; H. S. Jackson, Corvallis, Oregon, vice-president, and Wm. T. Horne, Berkeley, California, secretary-treasurer. Preliminary arrangements were made for a meeting at Corvallis, Oregon, during next winter.

The Paris correspondent of the *Journal* of the American Medical Association writes that there were 745,539 living infants born in France last year as contrasted with 750,651 in 1912. No lower total has ever been registered, with the exception of the year 1911. In recalling the steady fall in the French birthrate, it will be enough to mention that the annual average of living births was 945,000 during the period from 1872 to 1875; that, since 1907, the number of births dropped below 800,000, and since 1911, below 750,000. This means that in less than forty years the French births have diminished by more than 200,000 a year. The proportion of living children to every ten thousand inhabitants was 188 in 1913, instead of 190 in 1912, 187 in 1911, 196 in 1910, and 205 in 1906. The decrease, therefore, is accentuated each year. It is true that the birthrate is falling in all the large countries of Europe, but the proportion is much less than in France; and, moreover, the excess of births over deaths is proportionately five or six times greater. Thus, for the year 1912, the excess of births over deaths for each ten thousand inhabitants was only 15 in France; in the same year it was 158 in Holland; 140 in Italy; 130 in Hungary; 127 in Germany; 107 in Austria, and 105 in England. Last year showed an excess of 41,901 births over deaths, or only 10 for each ten thousand. The excess in 1912 was 57,911, or 15 per ten thousand. This diminu-

tion is due to a deficit of 5,112 births and an increase of 10,989 deaths. The departments in which the birthrate exceeds the deathrate are those of the north, Pas-de-Calais, Brittany, the frontier regions of the northeast, Limousin and Corsica. On the other hand, the valley of the Garonne, Normandy, the plateau region of Langres and Dauphiny continue to lose ground. The number of deaths (703,638) is greater by 11,000 than that of 1912, which was lower than any recorded number since the opening of the nineteenth century. The proportion of deaths to the population is 178:10,000, as against 172 in 1912, 196 in 1911 and 179 in 1910. The mortality has increased in 64 departments, and particularly in Bouches-du-Rhône, Dordogne, Var, Haute-Savoie, Corsica, Somme, Haute-Vienne, l'Aveyron and Tarn-et-Garonne. In 1913, 298,760 marriages were recorded, or 13,169 less than in the preceding year. The proportion of the newly married for each ten thousand has dropped from 158 in 1912 to 151 in 1913. The number of divorces has increased by about 500; 15,076 were recorded in place of 14,579 in 1912. The increase has therefore continued; in 1900 there were but 7,157 divorces; in thirteen years the number has more than doubled.

THE University of Chicago Press announces for fall publication the first two titles in the University of Chicago Science series. The size of the books will be 100 to 150 pages, duodecimo. The books that are ready for publication are: "The Origin of the Earth," by Thomas C. Chamberlin, head of the department of Geology in the University of Chicago; and "Isolation and Measurement of the Electron," by Robert A. Millikan, professor of physics in the University of Chicago.

THE Smithsonian Institution has issued a treatise on "Atmospheric Air and its Relation to Tuberculosis," by Dr. Guy Hinsdale, as one of the prize essays on that subject presented in connection with the Washington Tuberculosis Congress. The book including 136 pages of text and 93 plates of illustrations, forms publication 2,254 of the Smithsonian Miscellaneous Collections. It is not a public document and is distributed free only to libraries and specialists.

## *UNIVERSITY AND EDUCATIONAL NEWS*

IT is proposed to establish a school of public health at the University of Minnesota, and a meeting was held to discuss plans for the school, July 13. The instruction is to be entirely by the present teaching staff, and will include the consideration of the subject from a medical as well as from a modern sanitary engineering standpoint.

SCHOLARSHIPS have been awarded by the Educational Fund Commission, of which Dr. John A. Brashear is president, to the teachers of the public schools of Pittsburgh, for the summer session of various educational institutions as follows:

| | |
|---|---|
| Commonwealth Art Colony, Boothbay Harbor. | 4 |
| University of Michigan | 2 |
| North American Gymnastic Union, Indianapolis, Ind. | 1 |
| Chautauqua Institution, Chautauqua, N. Y. | 10 |
| University of Chicago | 11 |
| Columbia University | 21 |
| Cornell University | 16 |
| Dartmouth | 4 |
| Harvard University | 14 |
| Zanerian College of Penmanship, Columbus Ohio | 3 |
| Ocean City Summer School | 3 |
| University of Pennsylvania | 4 |
| Pennsylvania State College | 7 |
| University of Vermont | 4 |
| University of Pittsburgh | 4 |
| American Institute, Northwestern University. | 1 |
| University of Wisconsin | 11 |
| University of Berlin, Germany | 1 |
| University of New York | 1 |
| N. Y. School of Fine and Applied Arts | 1 |
| Munich Trade School, Germany | 1 |
| Total number of teachers sent in 1914. | 124 |

REGISTRATION for the summer quarter at the University of Chicago has been announced, and an increase over the attendance of a year ago is shown. The total number of men registered on July 3 in the graduate school of arts, literature and science was 726 and of women 421, a total of 1,147; in the senior and junior colleges 1,249 men and 942 women, a total of 2,191; in the professional schools (divin-

ity, law, medicine and education) 577 men and 669 women, a total of 1,246; and excluding duplications, the registration for the entire university amounts to 1,696 men and 1,598 women—a grand total of 3,294.

Dr. A. I. Ringer, instructor in physiological chemistry at the University of Pennsylvania, has been elected assistant professor in physiological chemistry in the University of Pennsylvania School of Medicine.

Dr. Eugen von Hippel, of Halle, has been called to the chair of ophthalmology at Göttingen, in succession to his father, Dr. Arthur von Hippel, who retires at the close of the present semester.

Dr. Franz Keibel, of Freiburg, has been called to the chair of anatomy at Strassburg, as the successor of Professor G. A. Schwalbe.

---

## *DISCUSSION AND CORRESPONDENCE*

### TIN DISEASE AND POLAR EXPLORATION

It will be recalled that the Scott and Amundsen Antarctic expeditions were greatly handicapped by losing their petrol. Amundsen stated in one of his lectures in America that their petrol tins required frequent resoldering. According to the diary left by Captain Scott this "mysterious loss of petrol" was one of the chief contributory factors in their failure to return to safety.

In Scott's diary[1] of the return journey under date of February 24, 1912, he states:

> Found store in order except shortage oil—shall have to be *very* saving with fuel—. . . . Wish we had more fuel.

Again on February 26 he states:

> The fuel shortage still an anxiety. . . . Fuel is woefully short.

On March 2:

> We marched to the (Middle Barrier) depot fairly easily yesterday afternoon, and since that have suffered three distinct blows which have placed us in a bad position. First, we found a shortage of oil; with most rigid economy it can scarce carry us to the next depot on this surface (71 miles away).

[1] "Scott's Last Expedition," Scott, Huxley and Markham, p. 398.

March 4:

> We can expect little from man now except the possibility of extra food at the next depot. It will be real bad if we get there and find the same shortage of oil.

On March 7:

> If there is a shortage of oil again we can have little hope.

In his message to the public Scott says:

> We should have got through in spite of the weather but for the sickening of a second companion, Captain Oates, and a shortage of fuel in our depots for which I can not account. . . .

In Note 26 of the Appendix, the authors, Huxley and Markham, state:

> At this, the barrier stage of the return journey, the southern party were in want of more oil than they found at the depots. Owing partly to the severe conditions, but still more to the delays imposed by their sick comrades, they reached the full limit of time allowed for between depots. The cold was unexpected, and at the same time the actual amount of oil found at the depots was less than they had counted on. . . .
>
> As to the cause of the shortage, the tins of oil at the depot had been exposed to extreme conditions of heat and cold. The oil was specially volatile, and in the warmth of the sun (for the tins were regularly set in an accessible place on the top of the cairns) tended to become vapor and escape through the stoppers even without damage to the tins. This process was much accelerated by the reason that the leather washers about the stoppers had perished in the great cold. Dr. Atkinson gives two striking examples of this.
>
> 1. Eight one-gallon tins in a wooden case, intended for a depot at Cape Crozier, had been put out in September, 1911. They were snowed up; and when examined in December, 1912, showed three tins full, three empty, one a third full, and one two thirds full.
>
> 2. When the search party reached One Ton Camp in November, 1912, they found that some of the food, stacked in a canvas "tank" at the foot of the cairn, was quite oily from the spontaneous leakage of the tins seven feet above it on the top of the cairn.
>
> The tins at the depots awaiting the southern party had of course been opened and the due amount to be taken measured out by the supporting parties on their way back. However carefully

re-stoppered, they were still liable to the unexpected evaporation and leakage already described. Hence, without any manner of doubt, the shortage which struck the southern party so hard.

That the oil could have soaked the supplies placed seven feet below the oil tins by escaping through the stopper in the form of vapor, seems impossible. A possible and very plausible explanation of this leakage of oil is the conversion of ordinary tin into the allotropic form, gray tin powder. This change to gray tin powder is known to take place at a maximum rate at —48° C. and may take place more slowly at other temperatures below 18° C. Should this change occur along the soldered seams of the container, the mysterious leakage of oil might well be explained. This peculiar disintegration of tin is also shown by certain alloys of tin. Articles of pewter (tin 4 parts, lead one part) have frequently been known to show such changes and this change has indeed been given the name "museum disease," referring to pewter articles. Farup[2] claims that the admixture of other metals influences the rate at which said change occurs and in the series zinc, cadmium, copper, silver, lead, the accelerating influence increases in the order given, lead having the greatest accelerating effect. Since hard solder may contain 65 per cent. tin and since pewter is known to show this property, it may also be expected in such a hard solder. If such is the case, it is a good indication of the extreme care which must be exercised to meet the severe and unusual conditions surrounding polar exploration.

B. T. BROOKS
MELLON INSTITUTE OF INDUSTRIAL RESEARCH,
UNIVERSITY OF PITTSBURGH

[2] *Cf.* "Handbuch d. Anorganische Chemie," Abegg, $III_2$, pp. 550.

## CUBIST SCIENCE

THOSE stanch defenders of the citadel of pure science, who have so long arrayed themselves against the insidious invasion of metaphysics, must now arm themselves to repel a new foe. This is nothing less than that *dernier cri* of esthetic literature—cubism! Those who have come in contact with the cubist literature of Gertrude Stein or her disciples and imitators will recognize at once the diagnostic symptoms of infection in an article by P. C. van der Wolk in one of the most sober journals of genetics.[1] This paper is entitled "New Researches into Some Statistics of *Coffea*." Note the apparent innocence of the title. Here are some excerpts:

> In both of the former communications we saw how that generally the different curves, *within* the definite end curve, are present in a greater or smaller number of removings; the tops of the different curves remove in all directions, whereby the crucial point is still that the place of those tops is not so arbitrary. . . . I thought in the beginning to have an instance in which all the curves exhibited precisely the same top as was the case with the first four curves. Suddenly however halfway up the tree, the top thrust out a large distance to the right side, and to my astonishment the consequent curves as well as the definite end curve exhibited exactly the same top as curve 5. It is noteworthy that this top-removing happened *suddenly, without transition*. . . . Let us now refer back to both of the previous investigations. We then once more observe all those analyzed curves. Is there then a difference in principle between this newly recorded case and all the others? Is there a difference in principle in the question whether it is *only once* that a top-removing of the curves occurs within the end curve (as in our present case) or that *several times* top-removing takes place (as is the case in the two previous communications). Certainly not. [Italics are the author's.]

The scientific world will await with renewed interest this author's fourth communication, which we understand is to be a statistical study of top-removing in *Cannabis indica*.

J. F. A.

[1] *Zeitschrift für Induktive Abstammungs- und Vererbungslehre*, 1914, XI., p. 355 ff.

## MOTIONS OF ATMOSPHERE

TO THE EDITOR OF SCIENCE: Recent letters from mathematicians and physicists seem to show that there are very few students or professors in our universities who pay much attention to the difficult problems that refer to motions of the atmosphere on a large scale. But surely there must be some physicists who

are giving atmospherics close attention, even though the problems do seem too difficult for them to handle, either in printed memoirs or in lectures before their classes. I beg to utilize the columns of SCIENCE in an effort to ascertain the existence of such scholars and to solicit their cooperation with me in an endeavor to stimulate the study of the motions of the atmosphere.

The U. S. daily weather map of the northern hemisphere and *The Monthly Weather Review* will undoubtedly be useful to all earnest students.

CLEVELAND ABBE

## SCIENTIFIC BOOKS

*The Fungi which Cause Plant Disease.* By F. L. STEVENS, Ph.D. New York, The Macmilan Co. 1913. Pp. 754. Figs. 449. Price $4.00.

Eighteen years ago the classic work on "Pilzpärasitaren Krankheiten der Pflanzen," by Frank, made its appearance, while the "Diseases of Plants Induced by Cryptogamic Parasites," by von Tubeuf and Smith, was published a year later. Despite the fact that a number of efforts have been made within the last few years by American writers, pathologists in general have been still looking for a new work that would satisfactorily supplant these older volumes. Stevens has entered the field with another volume which is intended to supplement his earlier and less technical work on "Diseases of Economic Plants." In the words of the author, "effort has been made to avoid duplication of matter contained in that volume." It is to be regretted that but little of the mycological and pathological activities of the past three years will be found in this new work (1911 in part only). This is to be deplored, since plant pathology has been passing through a period of rapid progress. It will perhaps be only fair, however, to overlook this shortcoming in passing judgment on the work in question. To what extent these two volumes will meet the expectations and needs of American students time alone will reveal. Perhaps we are expecting too much, but our mind has pictured the old classics as but stepping stones to the desired goal.

This new volume includes keys to the orders, families and genera of Myxomycetes, Schizomycetes and Eumycetes containing parasitic species. According to the author's statement, "Nonparasitic groups closely related to those that are parasitic have been introduced in the keys merely to give a larger perspective to the student." Directing our attention to the Ascomycetes, we may note that the keys are in the main translations from "Die natürlichen Pflanzenfamilien," with omissions and abbreviations, and occasionally the introduction of new genera. Parallel choices are indicated by marginal indentation, the characters employed in the original being omitted. Turning to the Fungi Imperfecti, we find that after the key to the hyaline-spored Sphæroidaceæ which follows Engler and Prantl quite closely, the keys appear for the most part to be transcriptions from Clements's "Genera of Fungi" with only slight modifications. The student who can steer his way through the key to the hyaline-spored Sphæroidaceæ without becoming lost in a bewildering tangle of spores, pycnidia and stromata, would deserve early election to Sigma Xi.

It is not possible to enter into a detailed discussion of the keys, but it seems that the author has relied too much on keys published some years ago, so that they are not always in harmony with our present knowledge. For example, "Conidia not in pycnidia, dark brown" is used as the key character for *Melanconis* (p. 279), although it is now known that certain species produce pycnidal (*Fusicoccum*) and acervular (*Coryneum*) stages.

According to the keys the vegetative body of the Schizomycetes is a "single-walled cell" (p. 3); *Nœmospora* is placed under the division with muticate conidia (p. 538), probably correctly, but the text description says "with a bristle at each end." This genus is given under both the Hyalosporæ and the Scolecosporæ (pp. 538 and 562).

The experienced mycologist makes little use of keys, but when he does care to use them he will certainly go to the original. The prin-

cipal advantage of the present volume is that it does make the keys available for students who have no knowledge of German or Latin, but such students are out of place in mycology or pathology.

Speaking of the work as a whole one is impressed with the number of its typographical errors. It is not difficult to find pages with three to four each, and their character leads one to suspect that they are not entirely printer's errors. Many are more striking than the use of a wrong letter in a word. The following serve to illustrate the type: *host* for bast; *perithetical* for perithecial; *epithelium* for epithecium (see also author abbreviations).

There is an apparent tendency to exclude from consideration the species of fungi parasitic only on wild hosts of no economic importance, although this practise has not been rigidly followed. In genera containing many species these appear to be presented in kaleidoscopic succession—if there is any logical arrangement either alphabetical, host, phylogenetic or according to importance we have not been able to detect it. The descriptions are especially full in those groups which have been monographed somewhat recently.

Attention will be directed to a few of the remarkable statements which have attracted the writer's attention. "Tubeuf ranks as *hemi-parasites* those organisms that usually are parasites, but may sometimes become saprophytic, and as hemi-saprophytes such as are usually parasitic, but may exceptionally become saprophytic." It is fortunate that this definition is followed by the statement that "these distinctions are of little import" (p. 2). Teachers of botany will probably be impressed by the rarity with which *hypha* is used in the text, and the apparent application of the term to spore-bearing branches only (pp. 60 and 477). The statement that "the oogonium becomes free just before conjugation" (p. 74) gives a mixture of isogamy and heterogamy in the terms employed, while the information that "sexual spores (zygotes) are produced through the union of the two like gametangia" (p. 102) could have been presented in less objectionable form. The description of *Sclerotinia trifoliorum* Erik, is followed by the strange statement: "Unknown on clover" (p. 143).

In the face of the general consensus of opinion in America that the chestnut blight fungus belongs to *Endothia*, it seems strange that the author accepts Rehm's classification. According to the description of the blight fungus the perithecia are "deeply embedded in the inner bark," the summer spores are "pale yellowish," and "the perithecia appear in abundance upon or in cracks in the bark, extruding their spores in greenish to yellow threads" (p. 208). This is indeed quite a contrast to the true condition: perithecial stromata erumpent from beneath the periderm, ascospores forcibly expelled, and pycnospores hyaline.

The student's conception of the morphology of the promycelium will be a little mixed when he reads: "In every species the mycelium eventually gives rise to teliospores, which produce in germination four basidia, either remaining within the spore-cell or borne in the air on a short promycelium, each basidium supporting a single-stalked or sessile basidiospore" (p. 324). "Morphologically the promycelium is a basidium bearing its four sterigmata and four basidiospores" (p. 326). In various species of rusts the "peridia are scattered over the whole of the foliage" (p. 356) or "in elongated patches" (p. 376).

One may read that the hymenium of *Hydnum* is "beset with pointed spines" (p. 414); that the young hyphæ of *Fomes fraxinophilus* "are very fine and require an immersion lens for observation" (p. 434); also of the "Oospora forms of the Erysiphales" (p. 474).

The statement that "*Phleospora moricola* (Pass.) Sacc. on Morus is a conidial form of *Septogloeum mori*," another imperfect fungus, is hardly in accord with mycological practise.

Considering the chaotic condition of mycology, it is not surprising that some species are duplicated or listed under the wrong genera. We may note, for example, that *Septoria cerasina* Pk. (p. 520) is described without any

intimation that it is synonymous with *Cylindrosporium padi* Karst. (p. 562). *Phyllostica hortorum* Speg. is given with no reference to the European work which showed that this egg plant fungus is an Ascochyta (p. 487). *Strumella sacchari* Cke. is listed as the only representative of the genus (p. 656), although it has been definitely shown that this fungus should be referred to *Coniothyrium*.

The author has very consistently followed the practise of decapitalization of specific names throughout the text, and for this he should be commended, although the rules of nomenclature dictate otherwise. It is difficult, however, to understand why species names became sufficiently important in the index to be uniformly capitalized! The very general botanical practise of italicizing binomials has been completely ignored, and will probably meet with little approval. The misspelling of scientific names is altogether too frequent. These are well illustrated by "*Pithiacystis citriophora*" (p. 77) and "*D. wilkomii*" (p. 144).

It is to be hoped that the accuracy of the author citations for the binomials is not indicated by the entire lack of any regular and consistent practise in their transcription and arrangement. Without regard to the length of the author's name, it is abbreviated (Sh. = Shear) or written out in full (Müller-Thurgau, p. 148). The same author's name may be written in full or abbreviated in a variety of ways, and in many cases these abbreviations are not in accord with mycological practise (*e. g.*, D. By., DeB. = De Bary; E. & H., E. & He., Er. & Hu., = Eriksson and Henning.) There are numerous cases of full names terminated by a period, indicating an abbreviation, and dozens of abbreviations without a period, indicating the full name of an author. Thus the amateur reader might wonder who Prill, West, Hohn, March, Plow, Rost, Berk, Karst, Heuff and others were, while for Frank., Brizi. and Petch., he might imagine the existence of such mycologists as Frankenstein, Brizioski and Petchnikoff. There are many errors in the spelling of author abbreviations, and in some cases they bear little resemblance to the original (*e. g.*, Farm. = Farneti; Hu. or Hem. = Henning; Fes. = Fries; Car. = Carvara; Gus. = Güssow; Ren. = Reinke; Heuff. = Heufler; Nebr. = Neuman.)

The profusion of illustrations (Figs. 1–449) certainly adds greatly to the value of the book. They are drawn quite extensively from American authors and are in the main well chosen. But in the Fungi Imperfecti many of the figures taken from Lindau's treatment in "Die natürlichen Pflanzenfamilien" appear rather crude. The author's effort to include "at least one illustration of each genus that is of importance in the United States" is a very commendable feature.

The illustrations are reproduced with the original figures or letters used in their explanation, even though in some cases (Fig. 288) they may be almost microscopic in size. The presence of numbers and varieties of figures and letters not used in the legends (*e. g.*, Figs. 9, 82, 88, 275, 413, etc.) may not be of any harm but they give a scrap-book appearance. The explanations of figures are in many cases too short (Figs. 13, 20, 129, 145, etc.) or incomplete (Fig. 351). There is no uniform style of punctuation in the legends, great variety prevailing (*e. g.*, Figs. 179, 198, 200, 421). Apparently the author has not been able to entirely discard the old practise of calling a pycnidium a perithecium (Fig. 354, also p. 493).

It would seem a little questionable to use a figure of a germinating teleutospore of *Gymnosporangium* (Fig. 266) showing two promycelia from a single cell in a work which should present the typical rather than the abnormal.

Following the customary practise, the illustrations are credited to various writers. If the student should assume the authenticity of the acknowledgments, as he naturally would, he would get some wrong ideas of the photographic activity of at least one author. Fifteen half-tones of basidiomycetes are presumably "after Clements." Five of these can be found in Freeman's "Minnesota Plant Diseases" as "Originals," one is from Lloyd,

one from Hard and four are from Atkinson's "Mushrooms."

According to the preface, "abundant citations to the more important papers are given, sufficient, it is believed, to put the student in touch with the literature of the subject." These are distributed through the book as five separate bibliographies, one for each of the principal divisions or classes, with a list of "some of the most useful books," at the end of the volume. It is difficult to detect any principle that has been followed in the selection of references, since some very unimportant work is cited while the student is left in the dark concerning the sources of information for some more important fungi.

The citations in the five general bibliographies are in neither alphabetical arrangement nor chronological order, but are listed in part in the order in which they are used. The climax is reached in the list of "some of the most useful books," 1–29 being arranged alphabetically by authors, while 30–64 are apparently not arranged at all. From 1–46, the author's initials, when used at all, stand first, while from 47 to the end the reverse order is followed.

Referring to all the bibliographies, it can be very emphatically stated that clearness is sacrificed for brevity. There is much waste space on each page that might have been utilized to good advantage. At the beginning of the first bibliography a key is given to the abbreviations used for the U. S. Department of Agriculture and Experimental Station publications, and a few of the more common serials, and this is followed by a statement that "other abbreviations are those usually employed or readily understood." This can hardly be true unless the book is used by students gifted with more than ordinary insight. It is extremely doubtful if such citations as the following would be clear to the average student: "O. E. S. B. 33: 308. 1896; Mo. Fruit B. 17: 1910; B. S. M. d.Fr 8: 22, 1892; Agr. Soc. 8: 292, 1894; N. S. R. Wales, 93; Unt. 9; F. B. 238: 14, 1907; Rept. Mic. Vio., N. S. Wales, 1909; Zeit. f. L. u. F. 408, 1910; Ruhland, Diss. 1903." The bibliographies contain numerous errors, typographical or otherwise, and there is at least one "Miss. Kew" (p. 111). The omission of the initials of authors in many cases is a confusing feature, and the errors of punctuation give some rather odd combinations (*e. g.*, Farlow, W. G. B. Bussey, Inst., 415, 1876; Detmers, O., B4; 1891). When a personal knowledge of an author is necessary in order that one may correctly interpret a citation, the beginner is certainly subjected to an unnecessary and an unjust handicap.

In the literature citations the author in many cases does not even follow his own key. For example, C. Bak. is given as the abbreviation for the Centralbl. f. Bakt. etc., II Abth., but this publication is listed also in four other ways. In the various bibliographies thirteen different combinations of abbreviations are used for the Berichte d. Deutsch. Bot. Gesellschaft, but first place must be assigned to the Bulletin Trimestriel de la Société Mycologique de France with nineteen combinations ranging from the simple to the complex.

The incompleteness of many of the references leads one to fear that many may be second-hand, and that they were never verified. The defects pointed out greatly impair the usefulness of the bibliographies.

A glossary of mycological terms precedes the index. The value of such a feature can not be disputed, but in this case clearness has again been sacrificed to brevity and there are too many instances in which only half the truth has been told (*e. g.*, stroma). Some adjectives are defined like nouns (*e. g.*, autœcious, cytolitic), while a noun may be defined as an adjective (*e. g.*, endophyte). The amateur who relies on this glossary will expect to find catenulate spores "linked as in a chain." or may be looking under leaves for parasites that are designated as hypophyllous.

The use of a single index, rather than separate host and parasite indices is a commendable feature.

In conclusion the writer must express his surprise that any firm with the reputation of the publishers would permit a book containing so many errors to pass through their

hands. They certainly owe to the author and American pathologists a speedy revision.

F. D. Heald

Zoology Building,
University of Pennsylvania,
Philadelphia, Pa.

*A New Era in Chemistry.* By Harry C. Jones. New York, D. Van Nostrand and Company. 1913. Price $2.00.

It is expected of a book written by a teacher and investigator so eminent as Professor Jones that it will be written in a clear, enthusiastic and readable style, and especially that it will be scientifically accurate and sound. That the book meets some of these expectations no one can doubt who reads Professor Howe's very laudatory review in the December number of the *American Chemical Journal.* The present reviewer, however, while recognizing merit in the book, certainly believes that no author should be permitted to go uncriticized who is so careless of his statements as is the author of "A New Era in Chemistry."

Among many other passages in the book which are open to criticism the following have been selected as representative.

In discussing the formula for benzene on page 12 the author says: "The study of the substitution products led to the conclusion that three carbon atoms in benzene are different from the other three. . . ." Whatever may be the final outcome of recent work in this field, it is certainly well known that the study of benzene and its substitution products led neither Kekulé nor any of his contemporaries to any such conclusion.

On pages 51–52 is given an inadequate, even quite erroneous, account of the stereochemistry of tartaric acid. The author writes, "Tartaric acid is especially interesting, having the constitution. . . . We see that it contains not only one asymmetric carbon atom, but two. These would have the opposite effects upon a beam of polarized light; the one half of the molecule turning it in one direction, and the other half turning it by an exactly equal amount in the opposite direction. The result would be that the substance would be racemic or optically inactive." Certainly no one can get any clear conception of the stereochemistry of tartaric acid from such a description.

Speaking, on page 63, of the one degree of freedom in the two-phase-one-component system, water and water vapor, the statement is made that "we can vary either the temperature or pressure, but varying the one we fix the other." And on the next page, in discussing the triple point, the author writes: "We can not move the point $T$ in any direction without destroying the equilibrium. . . ."

These are very careless statements, both telling what does not take place. What the author intends to say with respect to the former is that a change either of the temperature or the pressure brings about a concomitant change in the other. With respect to the latter it may be noted that $T$, the triple point, is a fixed point and therefore can not be moved. A change of temperature or pressure brings about the disappearance of one of the three phases, but does not move the point $T$.

On page 281 we read, "It [radium] is everywhere, also, in atmospheric air"; and on page 273 it is stated that the alpha particle "carries one positive charge of electricity." Radium apparently does occur nearly everywhere, but its presence in the atmosphere is yet to be demonstrated. The alpha particle carries two charges, not one.

The following, taken from pages 273, 277 and 287, are given as examples of careless statements. No objections are raised concerning what the author probably intended to say: "Radium is naturally radioactive as it is called." "A radioactive substance is one that gives off radiations. . . ." "The best method used was the ice calorimeter." "A gram of radium therefore liberates about eighty calories of heat every hour, during its whole life history." "The largest amount of radium emanation thus far obtained is only a fraction of a cubic millimeter; and, yet, this gives off three fourths of all the heat liberated by radium." A gram of radium liberates heat at the rate of "about" eighty calories per hour so long only as it remains sensibly a

gram. The expression "during its whole life history" has no meaning whatever in this connection. Concerning the last of the above statements it may be said that undoubtedly the equilibrium quantity of radium is meant, but it is not so stated.

On page 287 it is said that "the radium emanation induces radioactivity on all objects on which it is deposited." It is the disintegration products of the emanation which are deposited, and not the emanation itself. The next sentence, which reads, "This induced radioactivity decays or disappears, as the emanation which causes it decays," while perhaps not entirely wrong, certainly does not state the facts clearly.

In discussing the disintegration of radioactive substances the author uses the expression "life history" sometimes to mean the "half period" of Rutherford, as, for instance, on page 283, when he speaks of thorium emanation as having a much shorter "life history" than radium emanation; at other times, as on page 288, it is apparently synonymous with "mean life," for he here speaks of 2,000 to 3,000 years instead of 1,760 years; while in another place, pages 294–295, he uses the expression with obviously still another meaning, for he here says that "the life history of radium is between two and three thousand years. This means that none of the radium now present existed more than twenty-five hundred years ago." There may be a legitimate sense in which one may speak of the "life history" of a radioactive substance, but certainly the expression should not be used in place of "mean life" or "half period." It may be remarked that, quite contrary to the above statement of the author, a very considerable proportion of the radium now present in the earth's crust was in existence twenty-five hundred years ago.

In the judgment of the reviewer the author also indulges far too freely in sweeping, unqualified statements. As an example of such a statement the following is quoted from the chapter on the "Origin of Stereochemistry," page 58. "Kekulé had converted empiricism in the study of carbon into system. Van't Hoff had made possible the beginning of a science of organic chemistry." Most organic chemists will probably say of this, that while there is possibly a difference in degree, there is hardly a difference in kind between the achievement of Van't Hoff and that of Kekulé.

Another example is taken from page 137. "It (water) owes its existence to the fact that hydrogen and hydroxyl ions can not remain in the presence of one another uncombined." This, of course, in a sense, is true. But then the following equally impressive statement is also true. Hydrogen chloride owes its existence to the fact that, depending upon conditions, chlorine and hydrogen ions can or can not remain in the presence of each other uncombined, which is equivalent to saying that hydrogen chloride owes its existence to the fact that it is hydrogen chloride. Moreover, hydrogen and hydroxyl ions can and do exist together uncombined, and it is to this fact that the many important phenomena of hydrolysis are due.

It is always of doubtful expediency to criticize an author's English; nevertheless, the reviewer ventures to quote the following from pages 117 and 268:

"Take, for example, water. We would find most of the hydrogens united with oxygen to form molecules of water; but, in addition, we would have some free hydrogens and some free oxygens."

"Take a salt like potassium chloride. When it is thrown into water an electron passes from the potassium over to the chlorine. The chlorine having received an additional electron thus becomes charged negatively, while the potassium having lost an electron becomes charged positively. . . . Take, again, a salt like potassium sulphate. Each potassium loses one electron to the $SO_4$, which thus acquires two negative charges, the potassium having each one positive charge." If this sort of description is justified by its directness and dramatic effect, then perhaps the only criticism to be offered is that "potassium" (four lines above) should read "potassiums."

One is disappointed after reading of the

dramatic manner in which Kenjira Ota arrived upon the scene of his labors, pages 148–150, to find him accomplishing nothing more remarkable than the measurement of the freezing points of certain solutions.

In view of the fact that none of the author's own investigations have been in the field of radioactivity, it seems rather remarkable that the references, pages 260, 261 and 296, to the author's book on the "Electrical Nature of Matter and Radioactivity" are not supplemented by the titles of well-known standard works on the subject.

However, the reviewer does not wish to be understood as wholly condemning the book. Far from it. The idea of writing a book on a "New Era in Chemistry" is an excellent one, and the story, for the most part, is most interestingly told, but at the same time it is the reviewer's conviction that no one who permits so many inaccurate, careless and exaggerated statements to creep into his work should go unrebuked.

The book closes with an appendix in which are given some delightful personal reminiscences of the great men who made possible the "New Era in Chemistry."

Edward C. Franklin

*Rays of Positive Electricity and their Application to Chemical Analysis.* By Sir J. J. Thomson. Longmans, Green & Co. 1913. Pp. vi + 132. Price, $1.40.

The day of the monograph in physics is apparently here, and it will be hailed with delight not only by physicists, but also by workers in all of the neighboring sciences. For in a period like the present in which new material is appearing very rapidly, and in which the "accumulation time" of new viewpoints is extraordinarily short, it is of the utmost importance that the results of recent research be got as quickly as possible in some form which is intermediate between the journal article, with its inaccessibility and incompleteness, and the general treatise with its rigidity and inertia. Monographs of the sort which Longmans has announced, dealing with half a dozen of the more recently developed departments of physics and written by men who have been prominently identified with their development, will appeal to a wide audience.

And if the whole Longmans series is as good as the first number, the publishers, the authors, the editors and the public may all congratulate themselves. For Sir J. J. Thomson has done his very best work, so it seems to the reviewer, on positive rays, and the present monograph is a fascinatingly simple and straightforward account of that work, introduced by a discussion of the preceding work of Goldstein and of Wien, and supplemented by a chapter on the Döppler effect with positive rays, discovered and investigated chiefly by Stark and his pupils. If any one has had doubt about the effectiveness of the positive-ray method as a means of discovering the sorts of atoms and molecules which constitute the residual gases in discharge tubes, and the values of the electrical charges carried by these atoms and molecules, he should take enough time to study carefully the five plates of actual photographs contained in this book. The parabolas shown in these photographs are about as convincing evidence as could be desired.

R. A. Millikan

## SPECIAL ARTICLES

### DESICCATION OF CERTAIN GREGARINE CYSTS

In connection with other studies on the cephaline gregarine *Stylocephalus giganteus* Ellis some data have been collected during the past fall concerning the viability of the cysts of this sporozoon and the effect of dryness on the formation of sporocysts. This gregarine is a common parasite in the alimentary canal of the Tenebrionid beetles of the genera *Eleodes* and *Asida,* so abundant in the semi-arid plains of eastern Colorado.

The cysts of *Stylocephalus giganteus* are subspherical, about 450 microns in diameter and opaque white when first discharged from the host. Unlike the cysts of many species of gregarines, they are not provided with thick, gelatinous envelopes, their walls on the contrary, are quite thin, the gelatinous envelope

if present at all being reduced to a thin film. If placed in water immediately after being discharged from the host, the cysts remain unchanged in external appearance for 4 days or more. After about 5 days the formation of sporocysts has progressed to such an extent that the cysts begin to turn gray, changing gradually to jet black in the next 2 or 3 days. Shortly after reaching the jet-black stage the cysts dehisce by simple rupture, discharging the long chains of ovoid sporocysts. Ten days usually elapsed between the time the cyst left the host and dehiscence, and no cyst examined dehisced in less than 8 days.

By starving the hosts it was found that the cysts were discharged in numbers almost free from excrement, and that such fluid excrement as did accompany the cysts dried rapidly, leaving the naked cysts glued to the glass tubes in which the hosts were confined. On September 23, 1913, several *Eleodes* sp. which had been starved for five days were placed in clean test tubes and over fifty cysts collected. The fluid excrement surrounding these dried in less than three hours, leaving the naked cysts adhering to the walls of the tubes. The beetles were removed and the tubes loosely plugged with cheese cloth. After plugging the tubes they were returned to the rack and allowed to remain undisturbed for 138 days. During this time they were in the light that came in through a north window, but not in direct sunlight, and were subjected to severe drying, as the room in which they were kept was heated with dry air, which together with the naturally dry air of Colorado dehydrated the cysts to such an extent that they shriveled and fell to the bottom of the tubes. On January 23, 1914, such cysts as had fallen to the bottoms of the tubes were removed and examined. All were still white, showing that the last stages of sporocyst formation had not been reached, and all were much shriveled and wrinkled, being reduced to half or less of their original volume. The dry cysts were then placed in water and after twenty-four hours' soaking they resumed their original spherical shape, still remaining white. By the end of the second twenty-four hours in water they had turned dark gray, and on the third day all were jet black, some having dehisced the long chains of ovoid sporocysts. From the time of discharge from the host to dehiscence these cysts were in fluid excrement for less than three hours, in dry air for 138 days and in water for less than three days. During the period of drying they did not lose their vitality and sporocyst formation was not completed. That internal changes had taken place in spite of the dry air is suggested by the rapid completion of sporocyst formation when the cysts were placed in water, dehiscence taking place in three days as compared with maturation period of ten days required by cysts taken directly from fresh excrement and placed in water.

This ability of the cysts of *Stylocephalus giganteus* to withstand a certain desiccation is perhaps an important factor in the distribution of this parasite which is so generally successful in eastern Colorado. Two stages at least, the cyst and the sporocyst, and possibly a third, the sporozoite, must be considered as distributional stages, comparable to some extent to those stages of many parasites which are passed in the secondary hosts. Each cyst of *Stylocephalus giganteus* produces an enormous number of sporocysts, which, as in most species of gregarines, are well protected by tough coats, and from the standpoint of species distribution both the number of sporocysts and their tough, protective coats are presumably positive factors in increasing the chances of this species being taken into the alimentary canal of many hosts. If the cyst be destroyed the type of sporocyst is of no importance, and cysts are produced in relatively small numbers, since each represents a fusion of two adult gregarines. It is then essential to the gregarine species that the cyst be able to withstand the unfavorable conditions of the environment in the habitat of the host species until sporocysts may be formed. This is accomplished in some species as *Gregarina blattarum* Siebold of the cockroach and *Gregarina rigida* (Hall) of various species of grasshoppers, by the thick gelatinous envelope surrounding the cyst. This envelope when

dried forms a very tough coat for the cyst. In the case of *Stylocephalus giganteus* it seems that the physiological character which makes the cyst resistant to desiccation, even though dehydration proceed to the distortion of the cyst, is of value to this species in much the same way as the protective envelopes of the first two species. The host of *Stylocephalus giganteus* is active throughout the winter on warm days, so that this species does not have to overcome the loss of host during the winter months as does *Gregarina rigida* in the grasshopper, and *Eleodes* sp. have been taken in December and January containing as many gregarines as beetles of the same species taken in August. These beetles are however distributed through a semi-arid region and the favorite habitats of *Eleodes* spp., under stones or at the bases of shrubby plains plants, are quite dry for the greater part of the year, subjecting the cysts of *Stylocephalus giganteus* even though protected to some extent by the excrement of the host, to considerable drying. As shown by the cysts under observation moisture is essential to the completion of sporocyst formation, since the cysts kept in dry air did not reach the gray and black stages until after they were placed in water. By examination of the meteorological data for eastern Colorado it may be seen that the period of drying to which the cysts here considered were subjected, over four months, exceeds the average droughts in this part of the plains where *Eleodes* spp. are so extensively parasitized.

Max M. Ellis

University of Colorado

## SEMI-PERMEABLE CAPSULES

During a series of experiments to determine the permanency of the fermentative reactions of intestinal bacteria in stored waters, it became necessary to use semi-permeable capsules. A review of the literature failed to show any method which was suitable for our purpose.

As in McCrae's work, gelatine capsules (size 00) are used as a basis for the colloidin capsule. A glass tube about 15 cm. in length is warmed in the gas flame and pressed into the closed end of the empty gelatine capsule. The gelatine plug which inevitably forms in the glass tube must be removed, at this point by means of a wire, otherwise ruptures are liable to occur when the capsules are boiled later.

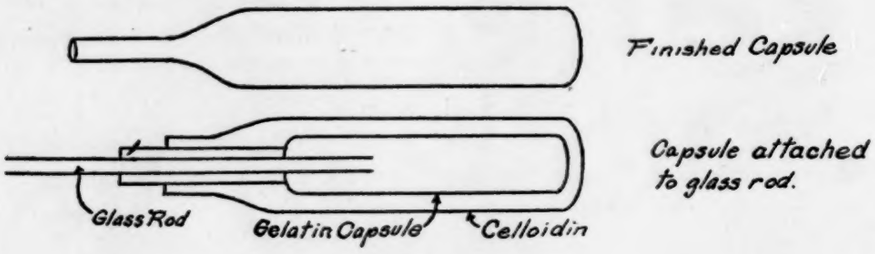


Fig. 1.

The union of the capsule and the glass rod is made airtight by coating the union with a twenty per cent. solution of gelatine by means of a small brush. The layer of gelatine is extended up the glass tube for a distance of about 4 cm. If the two halves of the capsule do not fit tightly, it is advisable to paint them also with the gelatine.

After thoroughly drying, the capsule is dipped into the colloidin solution (colloidin 1 part, ether 1½ parts and alcohol 1½) until a proper thickness is attained, which may be judged by holding the capsule before the light. Experience has shown that at least four dippings are necessary. It was found that the finished capsules were often weak at the point where the halves of the gelatine capsule meet. This point was strengthened by allowing additional colloidin to collect at this place. The

dipped capsules are allowed to dry over night. Premature boiling causes the capsules to swell and burst due to the presence of ether and alcohol in the inner layers of the colloidin. They should not be boiled until they are odorless.

The colloidin capsules are removed from the glass rods by immersing them in boiling water for ten minutes using the glass rods to control the capsules. Leaks may be detected by blowing through the glass rods. If no leaks are detected the capsules can be easily removed from the glass when the gelatin has melted. The capsules generally contain gelatine which may be objectionable in some experiments. This may be removed by filling the capsules with water and boiling them briskly for one half hour. If any of the gelatin remains, the process must be repeated until all has been removed.

The finished capsules may be filled with bouillon, water or any liquid media and sterilized by intermittent sterilization, after which they may be inoculated by platinum needle, pipette or hypodermic syringe. Sealing is accomplished by placing a drop of thick colloidon in the neck of the capsule and allowing it to harden. Leaks may be detected by washing the capsule with sterilized water, after which it is dropped into a tube of sterilized broth and incubated twenty-four hours.

WILLIAM W. BROWNE,
DAVID SOLETSKY
THE COLLEGE OF THE CITY OF NEW YORK

## SOCIETIES AND ACADEMIES

### THE WISCONSIN ACADEMY OF SCIENCES, ARTS AND LETTERS

THE academy in conjunction with the Wisconsin Archeological Society, the Wisconsin Audubon Society, the Madison Mycological Society, the Wisconsin Mycological Society and the Wisconsin Natural History Society, held its forty-fourth annual meeting at Milwaukee in the Public Museum, when the following program was presented:

*First Session Thursday, April 9, at 9 o'clock*

"Some Problems Involved in the Cultivation of Medicinal Plants," by Edward Kremers.

"The Garden City Movement in England and Germany," by L. S. Smith. (Illustrated.)

"The Significance of Highway Maintenance in the United States," by L. S. Smith. (By title.)

"A New Indicator for Acids and Alkalis," by A. F. Gilman.

"Origin of the Republican Party," by A. F. Gilman.

"Some Variations Noted in Gall Stones," by G. A. Talbert.

"Geologic Occurrence of Radium Ores," by Rufus Mather Bagg. (Illustrated.)

"The Relation of the Corpus Christi Procession to the Corpus Christi Play in England," by Merle Pierson.

"Some Versions of English Ballads Collected in Milton," by Mabel Maxson.

"William Gager and the Academic Drama at Oxford," by Karl Young. (By title.)

The second session was held on the evening of Thursday, April 9, at 7:30 o'clock, when Professor S. W. Williston, of the University of Chicago, delivered a lecture on "Early Land Animals of North America." This lecture was fully illustrated by many restorations of early extinct animals for the most part made by the lecturer. The lecture was well attended by the public, and was most interesting and valuable.

*Third Session, Friday, April 10, at 9:30 o'clock*

"The Climate of Madison, Wis. 1. A discussion of the observations of temperature, 1869 to 1913," by Eric R. Miller.

"The Approach to Popular Literature," by Arthur Beatty.

"A Method for Determining Approximate Metabolic Demands of Plants for Soil Water," by H. E. Pulling. (By title.)

"Physiological Changes Causing Black Heart in Potato Tubers," by E. T. Bartholomew. (By title.)

"Further Studies on Wisconsin Tremellineæ," by E. M. Gilbert. (By title.)

"Successful Method for Growing *Clitocybe illudens* and *Armillaria mellea*," by V. H. Young. (By title.)

"The Effect of Lateral Pressure on the Formation and Direction of Growth of Plant Organs," by J. B. Overton. (By title.)

"The Development of Botanical Microtechnique," by Gilbert M. Smith. (By title.)

"The Reaction of Pigment Cells in the Trout to Chemical Stimuli," by John M. Loshinski.

"Fertilization in the Parasitic Copepoda, *Lernæopoda Edwardsii* Olsson," by Nathan Fasten.

"Mutation and Atavism in Plants," by Howland Russell.

"Heat Budgets of European and American Lakes," by E. A. Birge.

"Physiological Age as Determined by Growth of Epiphasis of Wrist Bones," by A. H. Yoder.

"On Habits and Relationship of Some Muscoid Flies," by Sigmund Graenicher.

"Field Record of the Wisconsin Mycological Society for the Season of 1913," by Dr. Lewis Sherman.

"Species of *Clitocybe* in the Region of the Great Lakes," by Edward T. Harper. (By title.)

"Notes on Parasitic Fungi in Wisconsin," by J. J. Davis. (By title.)

"American Water-mites of the Genus *Atractides*," by Ruth Marshall. (By title.)

"The Land Vertebrates of Ridgeway Bog, Wisconsin; their Ecological Succession and Source of Ingression," by Hartley H. T. Jackson. (By title.)

*Fourth Session, Friday, April 10, at 2 o'clock*

"A Wisconsin Collection of Native Copper Implements," by H. F. Hamilton.

"Indian Earthworks and Sites in Adams County," by H. E. Cole.

"Archeological Researches in Western Wisconsin," by George H. Squier. (By title.)

"The Fond du Lac Cache of Copper Implements," by W. A. Titus. (Read by C. E. Brown.)

"Cairns and Garden Beds in Winnebago County," by George R. Fox.

"The Racial Characteristics of Wisconsin's Population," by Ellis B. Usher.

"Picture Writing by the Esquimaux," by George A. West.

"Archeological Evidences in Door County," by J. P. Schumacher. (By title.)

"Investigation of the Antiquities of Juneau County," by Ira M. Buell. (By title.)

"Archeological Researches in the Northwest Wisconsin Counties," by Charles E. Brown. (By title.)

"Survey of the Antiquities of the Green Lake Region," by Towne L. Miller. (By title.)

"Extension of the Range of Indian Garden Beds and Corn Fields in Wisconsin," by Charles E. Brown.

"Some Problems in Bird Protection," by Victor Kutchin. (By title.)

"Vanishing Horse-sense," by Victor Kutchin. (By title.)

"The Struggle for Game Conservation and Game Breeding Foci," by A. C. Burrill.

"Enforcement of the McLean Law for a Protection of Migratory Birds, etc.," by E. A. Cleasby. (By title.)

Papers 42 and 43 were not read, as Mr. Victor Kutchin was prevented by illness from being present.

Paper 45 was not presented, as Mr. E. A. Cleasby could not leave Iowa at this time because his presence was necessary to provide for the adequate protection of birds. In his absence, Mr. A. C. Burrill read a letter from Mr. Cleasby, gave an explanation of the present situation in Iowa, and presented in some detail the national work for the protection of birds which is being done by Mr. Cleasby.

The academy then adjourned. Next year the annual meeting will be held at Madison, when officers will be elected for the succeeding three years. At that time, the forty-fifth anniversary of the founding of the academy will be observed.

The present officers are:

*President,* Professor Dana C. Munro.

*Secretary and Treasurer,* Professor Arthur Beatty.

*Librarian,* Walter M. Smith.

Arthur Beatty,
*Secretary*

## The Kentucky Academy of Science

The Kentucky Academy of Science was organized on May 8, 1914, at a meeting held at State University, Lexington, Ky.

Sixty members were enrolled, and the following were elected as officers: *President,* J. H. Kastle; *Vice-president,* N. F. Smith; *Secretary,* Garnett Ryland; *Treasurer,* W. N. Anderson. Papers and addresses were delivered as follows:

"Some Features of the Ossification of Bones," by J. W. Pryor.

"Work of the U. S. Bureau of Mines," by Van H. Manning, of Washington, D. C.

"The Work of the Experiment Station and the Agricultural Prosperity of Kentucky," by Jos. H. Kastle.

"Science and the State," by Stanley Coulter, of Purdue University.

Garnett Ryland,
*Secretary*

June 30, 1914

## New Orleans Academy of Sciences

The regular monthly meeting of the New Orleans Academy of Sciences was held in Stanley Thomas Hall, Tulane University, on Tuesday, May 19. President W. B. Gregory presided with a large attendance of fellows and members. The program of the evening was a paper by Dr. R. B. Bean on "The Time of Eruption and Extent of Decay of the Permanent Teeth in Relation to Race, Sex, Stature, Morphologic Form, School Grade and Development of the Individual." The speaker called attention to the racial differences between Filipino, German and American children in these respects. There was considerable discussion of the paper by Dr. A. G. Friedrichs and other dentists and doctors. After the close of the discussion and adjournment refreshments were served to the fellows and members. The next meeting of the academy will not be held until October.

R. S. Cocks,
*Secretary*